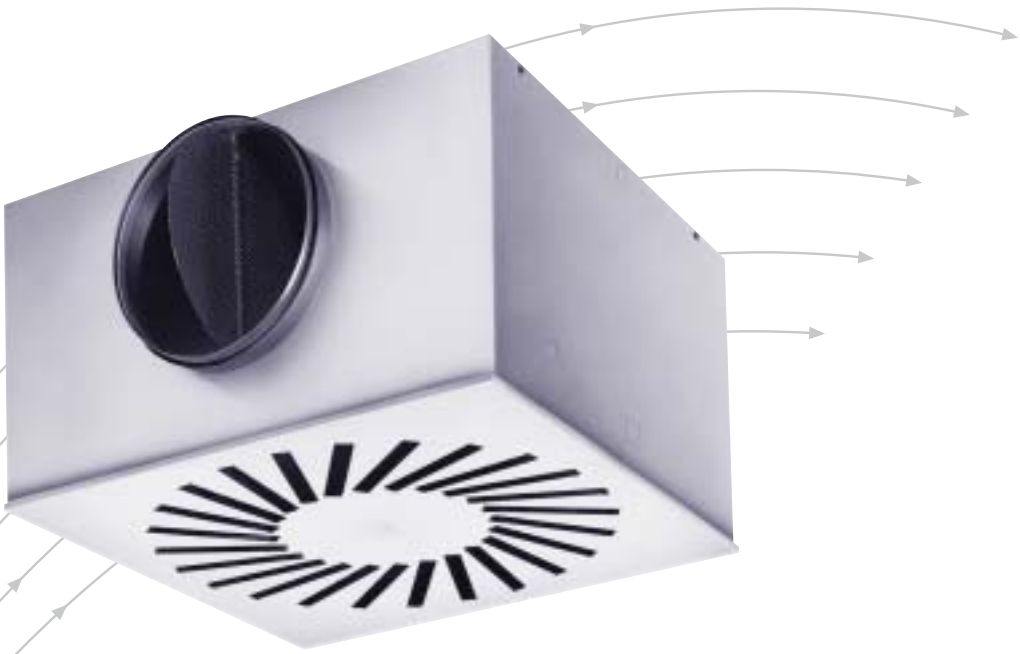
Swirl Diffuser

Type SDW

recommended for room heights from approx. 2.60 . . . 4.00 m



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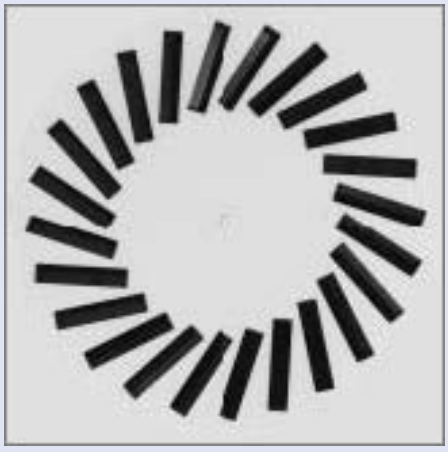
Contents · Description

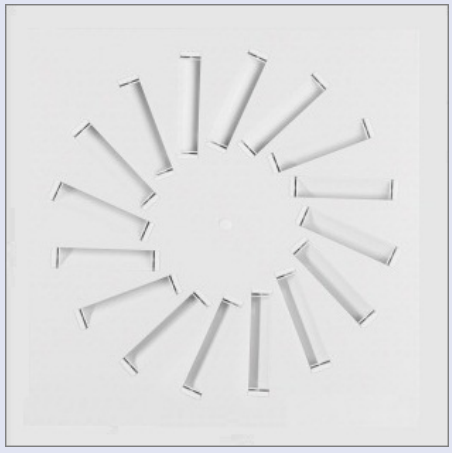
In addition to the existing range of TROX swirl diffusers, the type VDW swirl diffuser with manual adjustment has been developed.
This enables the direction of discharge to be altered on site to cater for changes in room layout or partitions.

Due to the rotary swirling motion of the air discharge, induction of room air occurs very quickly, resulting in a rapid decay of supply air velocity and temperature differential. Air change rates of 30 per hour can be achieved with supply air temperature differentials of +10K to –10K.
The diffuser can be supplied with white or black air control blades depending on architectural requirements and is available with multiple border profiles to suit most ceiling systems. Air is supplied via top or side entry plenum boxes. The type SDW can be used for either supply or extract air application. For supply air, special control elements are required. These are not necessary for use in the extract air mode.

SDW - QL.. - 0 Size 500 x 24 x 600
with black air control blades

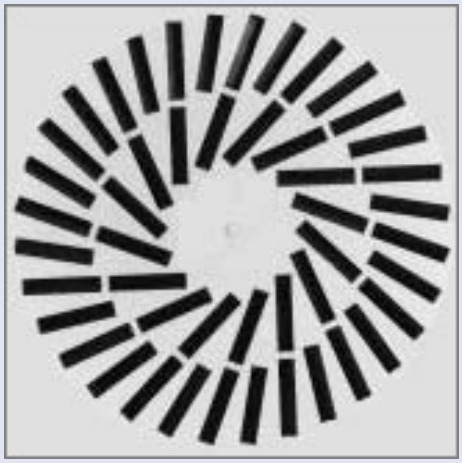


SDW - QL.. -Q21, Size 400 x 16 x 600
with white air control blades

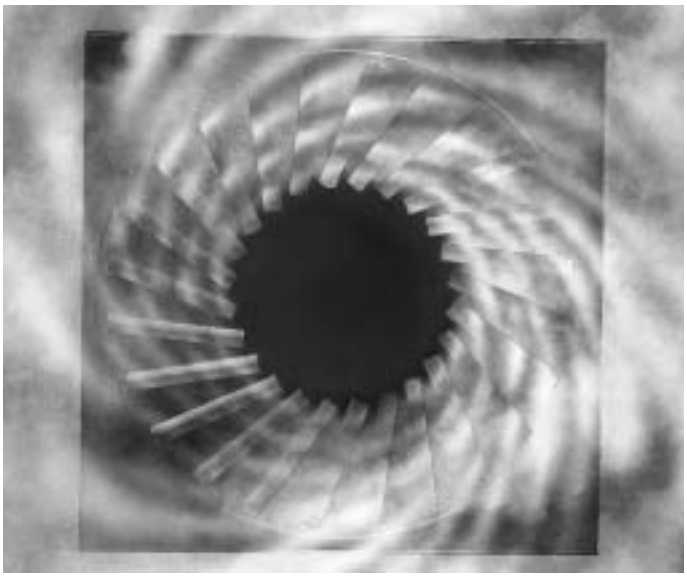


SDW - Q.. -Q21, Size 600 x 24
with white air control blades

SDW - Q.. -0, Size 600 x 48
with black air control blades



Discharge Characteristics

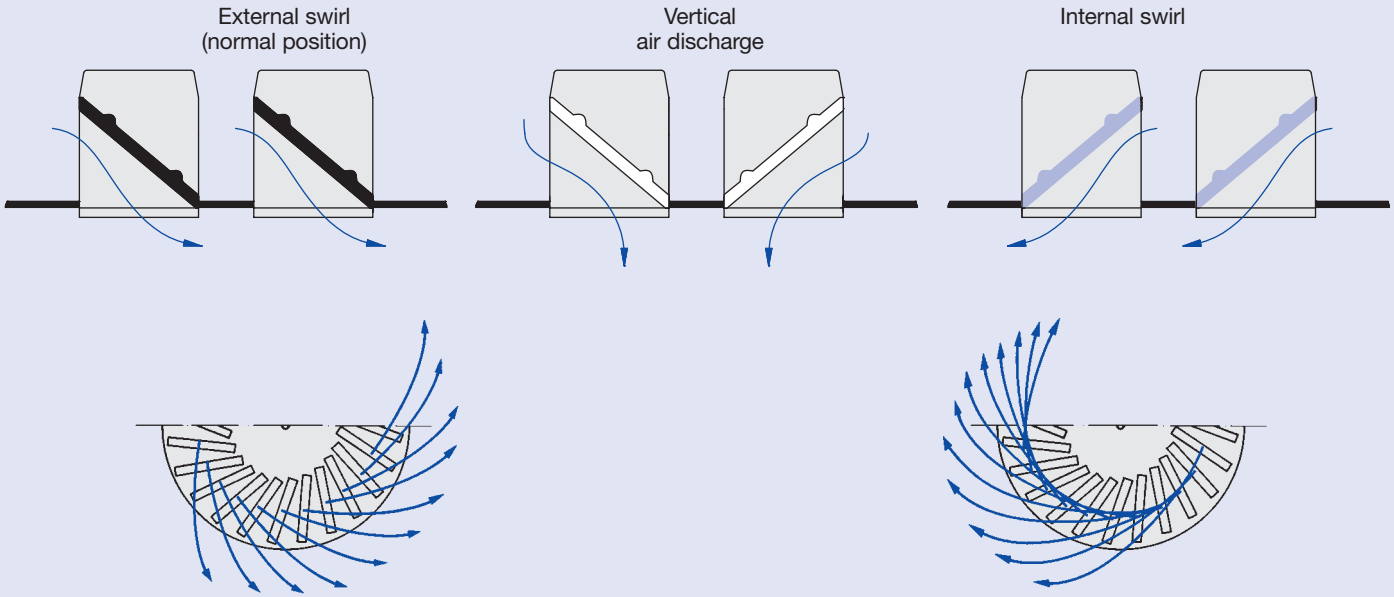


The manual adjustment of the SDW swirl diffuser means that architectural changes, for instance relocation of lightweight partition walls, can be catered for by changes in discharge pattern. Directions of discharge can be altered by adjustment of the control blade settings.

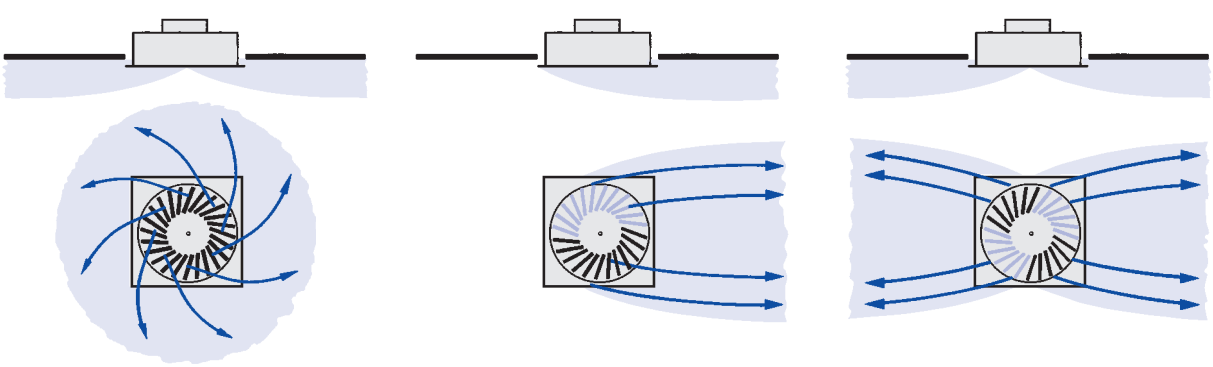
For sizes 300 x 8, 400 x 16, 500 x 24, 600 x 24 and 625 x 24 the air control blades are set as standard to external swirl and for sizes 600 x 48 and 625 x 54 the air control blades of the outer blade ring are set to external swirl and those of the inner blade ring to internal swirl.

The flow visualisation opposite shows the air discharge characteristics, control blades set for internal swirl.

Positions of air control blades



Discharge Characteristics for sizes 300 x 8, 400 x 16, 500 x 24, 600 x 24 and 625 x 24



All air control blades set to external swirl

Air control blades set half to external and half internal to swirl

Air control blades in each quartile of face are set in the same direction, adjacent quartiles set one internal one external swirl

Constructions · Dimensions

Construction

Type SDW are supplied in the sizes listed below:

Size 300 x 8 with 8 air control blades,
Size 400 x 16 with 16 air control blades,
Size 500 x 24 with 24 air control blades,
Size 600 x 24 with 24 air control blades,
Size 600 x 48 with 48 air control blades,
Size 625 x 24 with 24 air control blades,
Size 625 x 54 with 54 air control blades,

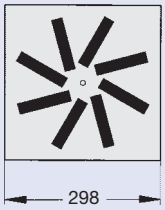
TROX type SDW diffusers are supplied with a square face plate as standard with multiple border options to match the specified ceiling system. For circular face diffuser options, refer to TROX type VDW.

The removeable face plate is held in the plenum box with a centre screw fixing. The head of the screw is covered with a decorative cap.

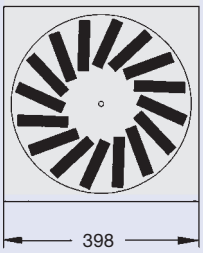
The plenum box is available with side or top entry spigot, with optional spigot mounted volume control damper on request.

For simple adjustment of the volume flow, TROX type AKV.. -Z (horizontal supply) plenum boxes can be supplied with an optional test connection for measurement of a reference pressure and a cord operated volume control damper.

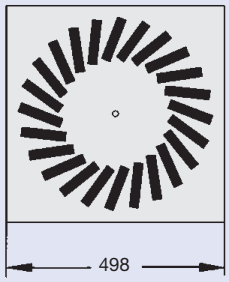
Size 300 x 8



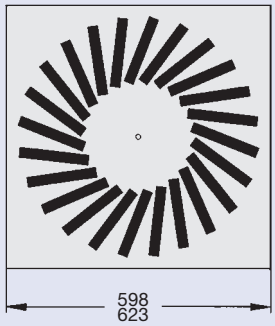
Size 400 x 16



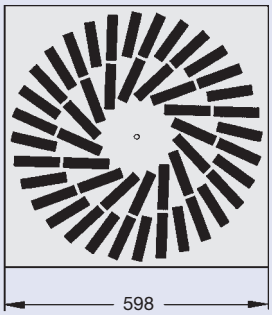
Size 500 x 24



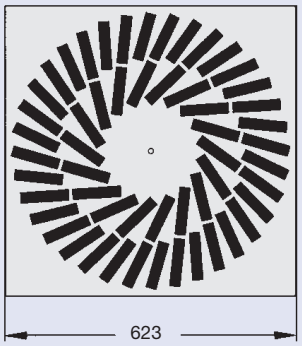
Size 600 x 24 / Size 625 x 24

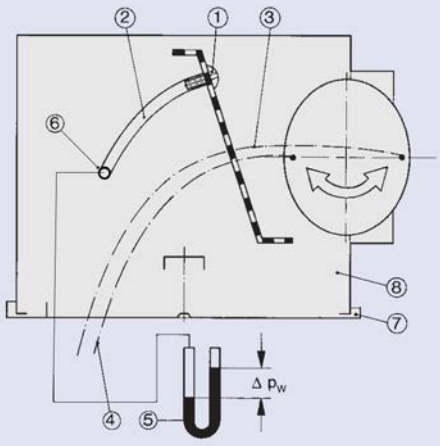


Size 600 x 48



Size 625 x 54





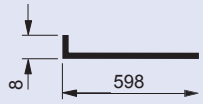
① Internal test nipple
② Plastic tube
③ Black cord - damper open
④ Black cord - damper closed
⑤ Inclined manometer
⑥ External test nipple
⑦ Diffuser face
⑧ Plenum box

TROX type SDW diffusers are available with alternative border profiles to suit most architectrual ceiling systems.

Diffuser can be supplied with standard face plate dimensions based on swirl element size (.. -Q) alternativly, if smaller diffusers are required, these can be specified with oversized face plates to match the ceiling system (... -QL)

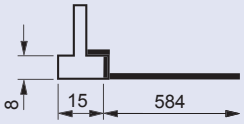
Size	Q	QL	QM15 QS15	QM26 QS26	QB
300 x8	298□	595□	584□/734□	573□/723□	599□
400 x16	398□	595□	584□/734□	573□/723□	599□
500 x24	498□	595□	584□/734□	573□/723□	599□
600 x24	598□	595□	584□/734□	573□/723□	599□
600 x48	598□	595□	584□/734□	573□/723□	599□
625 x24	623□	–	–	–	–
625 x54	623□	–	–	–	–

Type Q



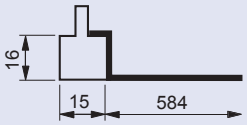
Face-mounted

Type QS15



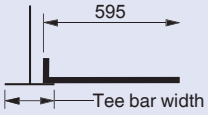
To 'Lay-on' Tegular tee-bar
15mm wide x 8mm deep

Type QM15



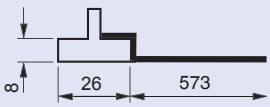
To 'Lay-on' Tegular tee-bar
15mm wide x 16mm deep

Type QL



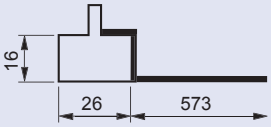
To 'Lay-on' FLAT tee-bar
15mm wide or 25mm wide

Type QS26



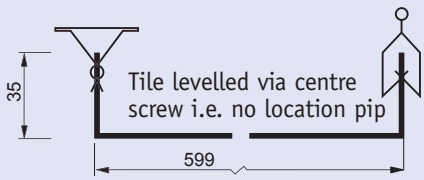
To 'Lay-on' Tegular tee-bar
26mm wide x 8mm deep

Type QM26



To 'Lay-on' Tegular tee-bar
26mm wide x 16mm deep

Type QB



To 'Push-In' spring tee-bar
Suitable for 'tee' or 'omega' type

Materials

The face plate is in galvanised sheet steel. The surfaces are pre-treated and powder coated white (RAL 9010).

The control blades are made from Polystyrol (PS 476L), with black (similar to RAL 9005) as standard or white (similar to RAL 9010) on request.

The plenum box is made from galvanised sheet steel, and is supplied self finish.

TROX type AKV-SDW plenums are manufactured with a 10mm internally formed flange and factory fitted foam seal to suit selected SDW border style.
Types ZH / ZV plenums come complete with perforated internal baffles to promote even air distribution with optional black faced, Class 'O' internal lining (... -D)

Assembly

The plenum box is suspended using support wires or threaded rods (supplied by others), using the drilled holes in the plenum return edge or hanging brackets when provided.

The diffuser face is fitted to the plenum box by means of centre fix screw locating in cross channel of the plenum box.

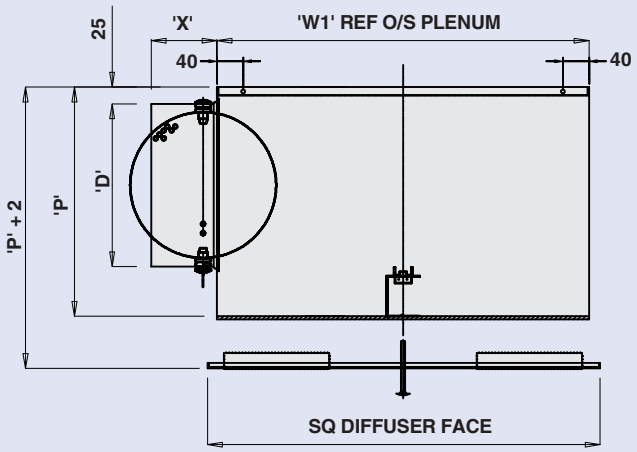
Plenum Types

ZH	Horizontal supply
AH	Horizontal extract
ZV	Top entry supply
AV	Top entry extract

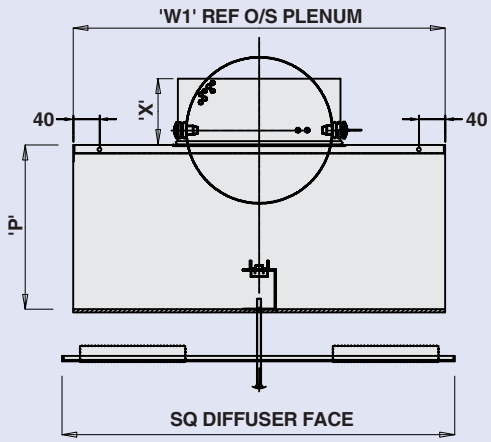
Spigot Types

0	No damper
M	Spigot mounted perforated damper

AKV-SDW...-ZH / AH



AKV-SDW...-ZV / AV

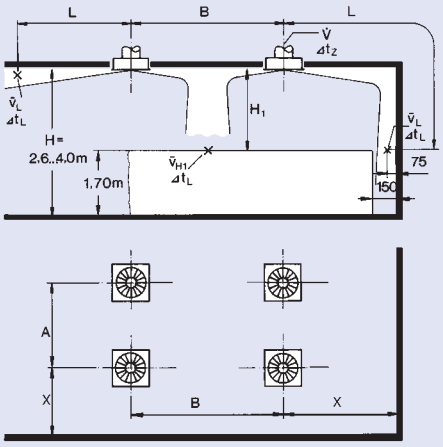


Spigot Type	'X'		
	Ø73 - Ø158	Ø178 - Ø398	Ø448 - Ø598
'O'	40mm		
'M'	75mm	100mm	N/A

SDW Size	'D' Nom	'D' Max	Q / QL			QM / QS			QB		
			'W1'	'P' MIN		'W1'	'P' MIN		'W1'	'P' MIN	
				ZH / AH	ZV / AV		ZH / AH	ZV / AV		ZH / AH	ZV / AV
300 x 8	158	248	290	(D +78)	(D/2) + 75	290	(D +78)	(D/2) + 75	290	(D +78)	(D/2) + 75
400 x 16	198	348	373	(D +78)	(D/2) + 75	373	(D +78)	(D/2) + 75	373	(D +78)	(D/2) + 75
500 x 24	198	448	477	(D +78)	(D/2) + 75	477	(D +78)	(D/2) + 75	450	(D +105)	(D/2) +102)
600 x 24	248	498	567	(D +78)	(D/2) + 75	567	(D +78)	(D/2) + 75	550	(D +105)	(D/2) +102)
625 x 24	248	498	567	(D +78)	(D/2) + 75	567	(D +78)	(D/2) + 75	NOT AVAILABLE		
600 x 48	248	558	584	(D +78)	(D/2) + 75	550	(D +105)	(D/2) +102)	550	(D +105)	(D/2) +102)
625 x 54	248	598	612	(D +78)	(D/2) + 75	612	(D +78)	(D/2) + 75	NOT AVAILABLE		

Note: Pressure drop and acoustic data for SDW diffusers based on 'D Nom' spigot sizes.

Nomenclature



$\dot{V}$	in l/s:	Supply air volume per diffuser
$\dot{V}$	in m³/h:	Supply air volume per diffuser
A, B	in m:	Spacing between two diffusers
X	in m:	Distance between diffuser centre and wall
H_1	in m:	Distance between ceiling and occupied zone
$\bar{v}_{H1}$	in m/s:	Time average air velocity between two diffusers at distance from ceiling H_1
L	in m:	Horizontal + vertical distance ($X+H_1$) discharge to the wall
$\bar{v}_L$	in m/s:	Time average air velocity at wall
Δt_Z	in K:	Temperature difference between supply air and room air
Δt_L	in K:	Difference between core and room temperature at distance $L = A/2 + H_1$ or $L = B/2 + H_1$ or $L = X + H_1$
A_{eff}	in m²:	Effective outlet area
Δp_t	in Pa:	Total pressure drop (supply air)
L_{WA}	in dB(A):	A-weighted sound power level
$L_{W\,NC}$	:	NC rating of sound power level
$L_{W\,NR}$	:	$L_{W\,NR} = L_{W\,NC} + 1$
L_{pA}, L_{pNC}	:	A-weighting and NC rating respectively of room sound pressure level $L_{pA} \approx L_{WA} - 8$ dB $L_{pNC} \approx L_{W\,NC} - 8$ dB
ΔL	in dB/Oct.:	Relative sound power level with respect to L_{WA}
L_W	in dB/Oct.:	Octave band sound power level of regenerated noise $L_W = L_{WA} + \Delta L$

Preliminary Selection (supply air)

Size	$\dot{V}_{max}$		$\dot{V}_{min}$		$L_{WA\,max}$	$L_{W\,NC\,max}$	$L_{WA\,min}$	$L_{W\,NC\,min.}$	A_{eff}
	l/s	m³/h	l/s	m³/h	dB(A)	NC	dB(A)	NC	m²
300 x 8	70	252	15	54	40	34	< 20	< 20	0.0070
400 x 16	110	396	30	108	40	34	< 20	< 20	0.0140
500 x 24	130	468	45	162	40	34	< 20	< 20	0.0210
600 x 24	190	684	60	216	40	34	< 20	< 20	0.0295
600 x 48	230	828	120	432	40	34	< 20	< 20	0.0390
625 x 24	190	684	60	216	40	34	< 20	< 20	0.0295
625 x 54	235	846	145	522	40	34	< 20	< 20	0.0470

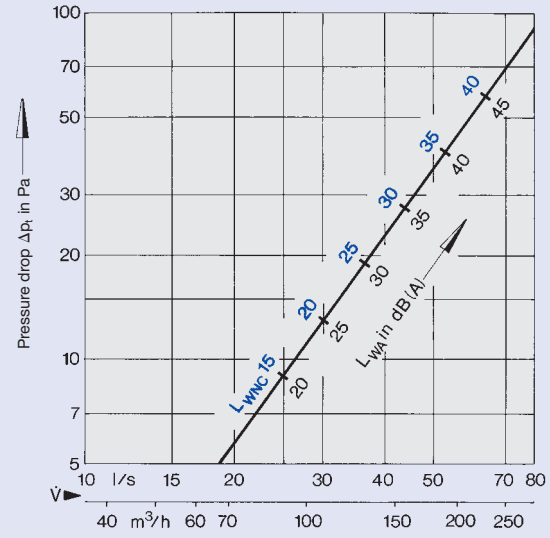
Octave band spectrum available on request!

Acoustic Data Type SDW-...-ZV

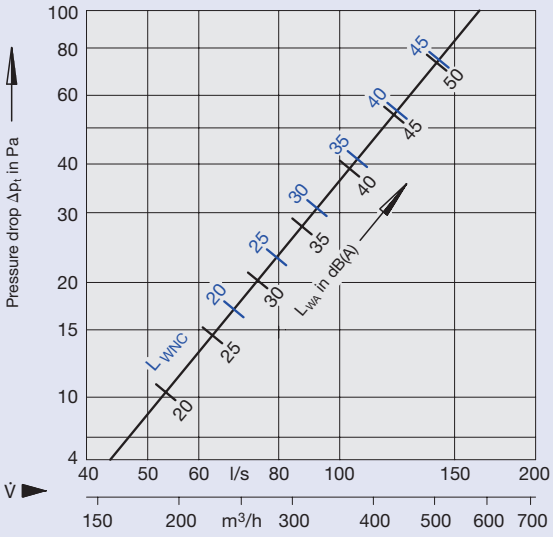
Supply air

Correction to diagrams 1, 2 and 3: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
300 x 8	Δp_t	x 1.0	x 1.2	x 1.8
	$L_{WA} / L_{W\,NC}$	–	–	–
400 x 16	Δp_t	x 1.0	x 1.1	x 2.0
	$L_{WA} / L_{W\,NC}$	–	–	+ 1
500 x 24	Δp_t	x 1.0	x 1.4	x 2.8
	$L_{WA} / L_{W\,NC}$	–	+ 3	+ 6

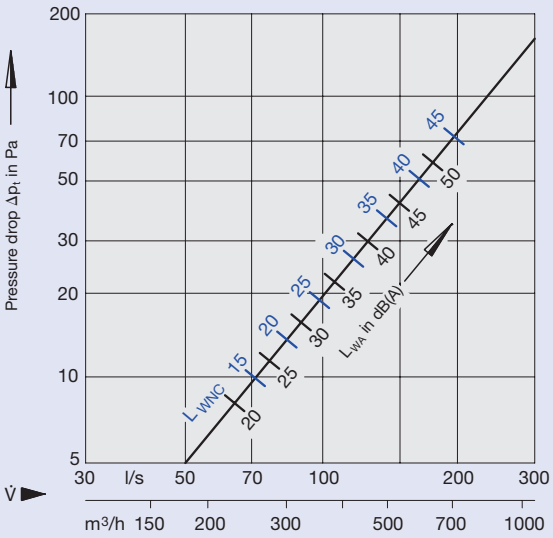
1 Sound Power Level and Pressure Drop
Size 300 x 8



2 Sound Power Level and Pressure Drop
Size 400 x 16

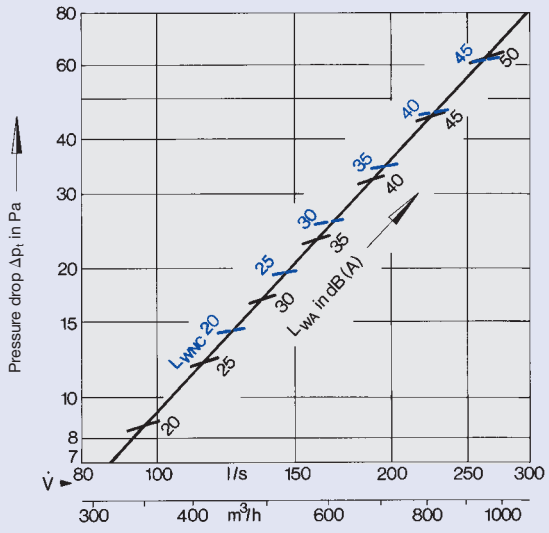


3 Sound Power Level and Pressure Drop
Size 500 x 24

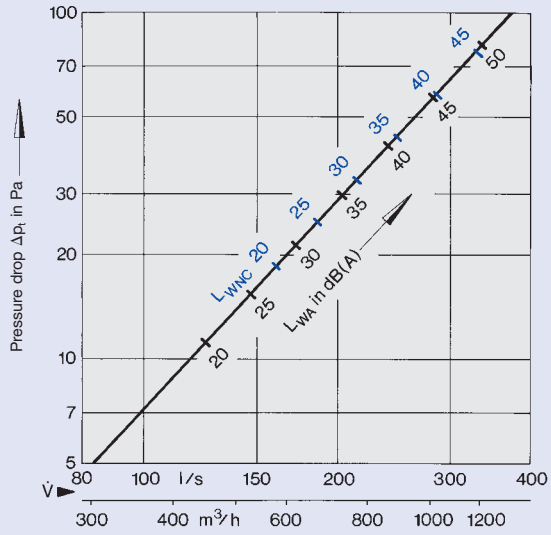


Correction to diagrams 4 to 6: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
600 x 24	Δp_t	x 1.0	x 1.3	x 2.8
625 x 24	$L_{WA} / L_{W\,NC}$	–	+ 3	+ 5
600 x 48	Δp_t	x 1.0	x 1.6	x 3.4
625 x 54	$L_{WA} / L_{W\,NC}$	–	+ 4	+ 9

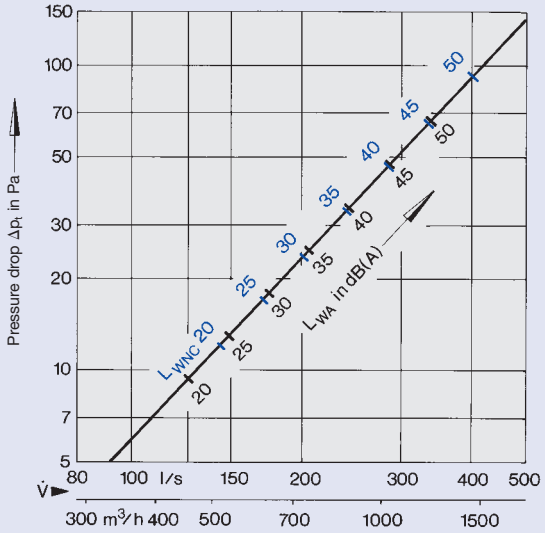
4 Sound Power Level and Pressure Drop
Size 600 x 24 and size 625 x 24



5 Sound Power Level and Pressure Drop
Size 600 x 48



6 Sound Power Level and Pressure Drop
Size 625 x 54

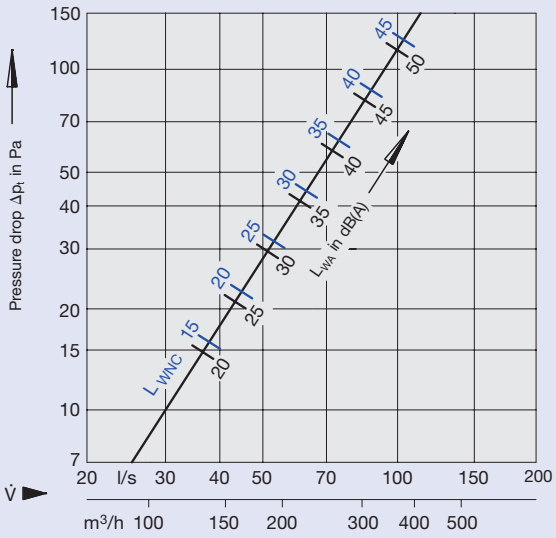


Acoustic Data Type SDW-...-ZH

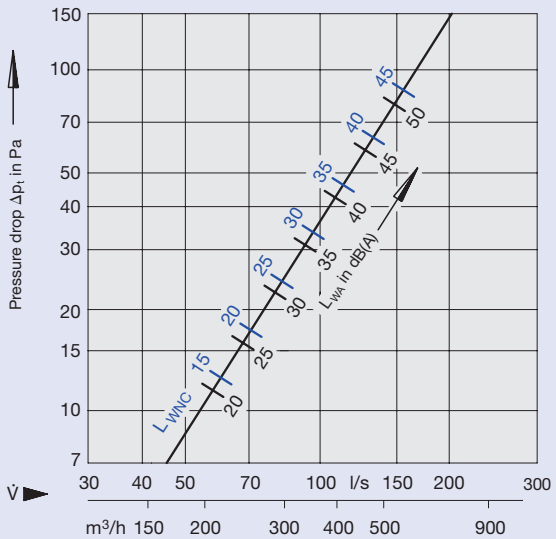
Supply air

Correction to diagrams 7 to 9: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
300 x 8	Δp_t	x 1.0	x 1.3	x 2.2
	$L_{WA} / L_{W\,NC}$	–	+ 3	+ 5
400 x 16	Δp_t	x 1.0	x 1.2	x 2.3
	$L_{WA} / L_{W\,NC}$	–	+ 1	+ 3
500 x 24	Δp_t	x 1.0	x 1.5	x 3.4
	$L_{WA} / L_{W\,NC}$	–	+ 2	+ 3

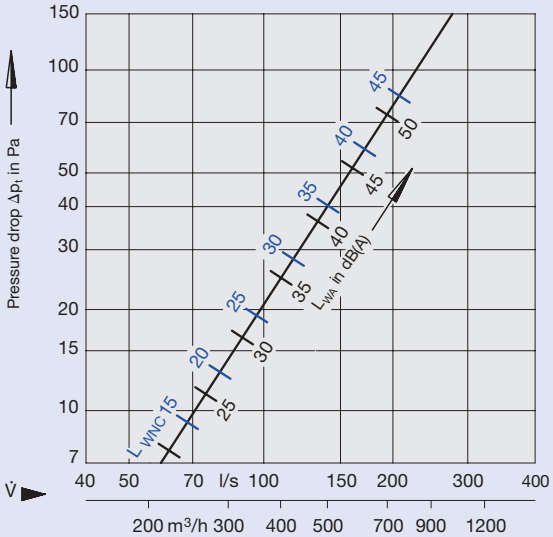
7 Sound Power Level and Pressure Drop
Size 300 x 8



8 Sound Power Level and Pressure Drop
Size 400 x 16

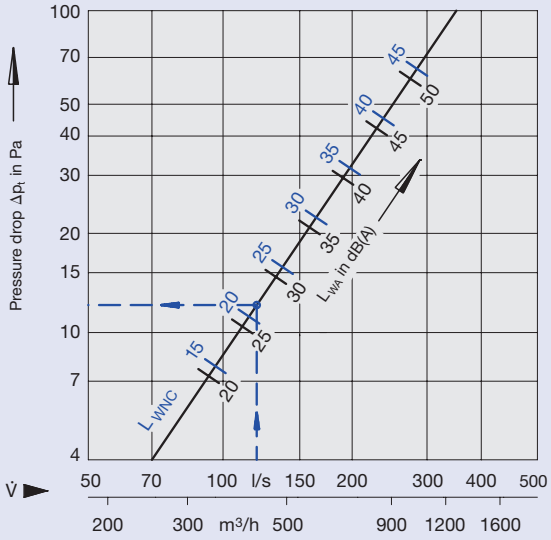


9 Sound Power Level and Pressure Drop
Size 500 x 24

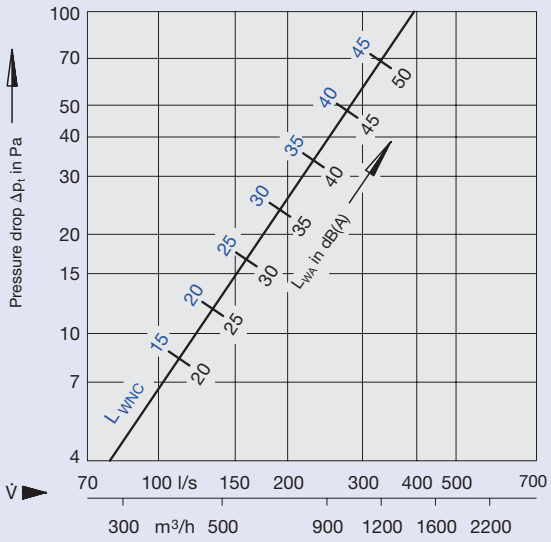


Correction to diagrams 10 to 12: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
600 x 24	Δp_t	x 1.0	x 1.5	x 4.0
625 x 24	$L_{WA} / L_{W\,NC}$	–	+ 2	+ 5
600 x 48	Δp_t	x 1.0	x 1.7	x 4.5
	$L_{WA} / L_{W\,NC}$	–	+ 4	+ 10
625 x 54	Δp_t	x 1.0	x 1.7	x 5.1
	$L_{WA} / L_{W\,NC}$	–	+ 5	+ 10

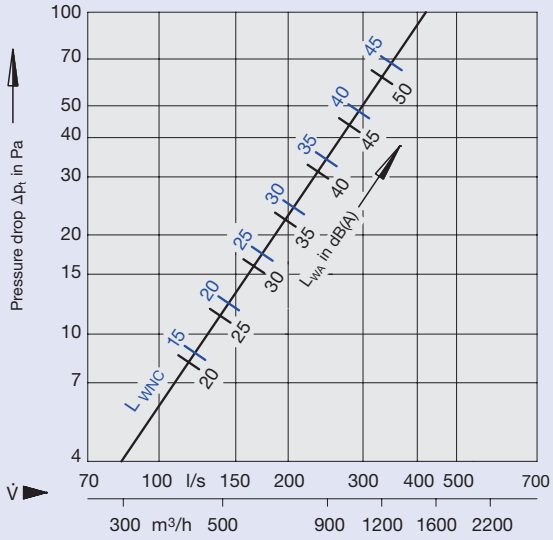
10 Sound Power Level and Pressure Drop
Size 600 x 24 and size 625 x 24



11 Sound Power Level and Pressure Drop
Size 600 x 48



12 Sound Power Level and Pressure Drop
Size 625 x 54



Acoustic Data

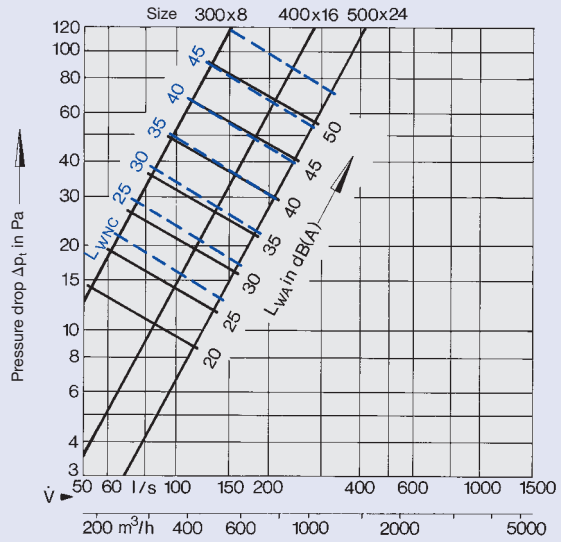
Extract air

Graphs 13 to 16 detail total pressure and noise levels for both horizontal (AH) and vertical (AV) extract terminal units with plenums but without air control blades.
Should return air diffusers be specified with air control blades (...-Q11, ...-Q21) to match supply air diffusers, please refer to graphs 1 through to 12 to establish the assoicated pressure drop and noise level.

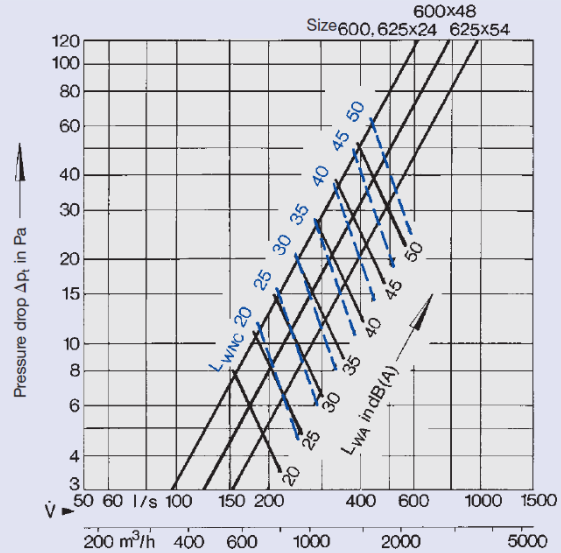
Correction to diagrams 13 and 15: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
300 x 8	Δp_t	x 1.0	x 1.5	x 3.0
	$L_{WA} / L_{W\,NC}$	–	+ 7	+ 9
400 x 16	Δp_t	x 1.0	x 1.8	x 4.1
	$L_{WA} / L_{W\,NC}$	–	+ 4	+ 9
500 x 24	Δp_t	x 1.0	x 1.8	x 4.1
	$L_{WA} / L_{W\,NC}$	–	+ 3	+ 9

Correction to diagrams 14 and 16: Volume control damper setting				
Size	**Damper angle**	**0°**	**45°**	**90°**
600 x 24	Δp_t	x 1.0	x 2.0	x 5.6
625 x 24	$L_{WA} / L_{W\,NC}$	–	+ 2	+ 9
600 x 48	Δp_t	x 1.0	x 2.0	x 5.6
625 x 54	$L_{WA} / L_{W\,NC}$	–	+ 2	+10

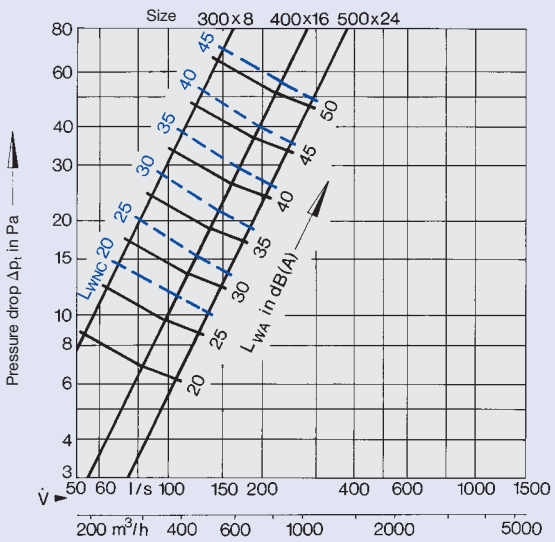
13 Sound Power Level and Pressure Drop SDW-...-AH



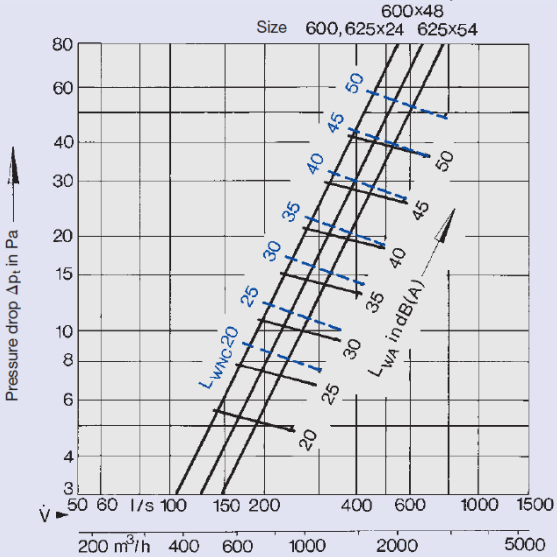
14 Sound Power Level and Pressure Drop SDW-...-AH



15 Sound Power Level and Pressure Drop SDW-...-AV

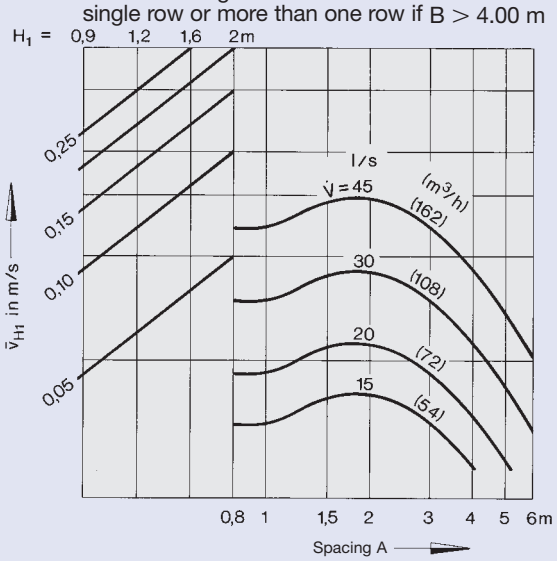


16 Sound Power Level and Pressure Drop SDW-...-AV

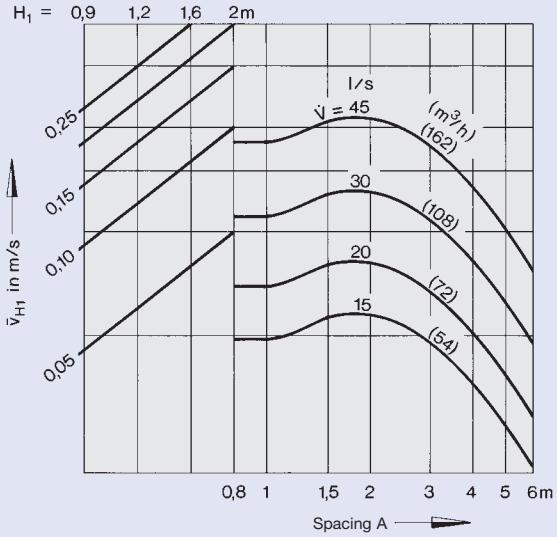


Correction!
For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

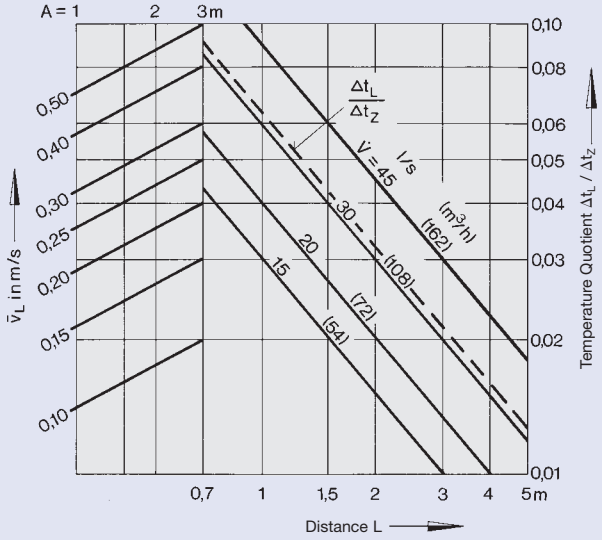
18 Diffuser arrangement:
single row or more than one row if B > 4.00 m



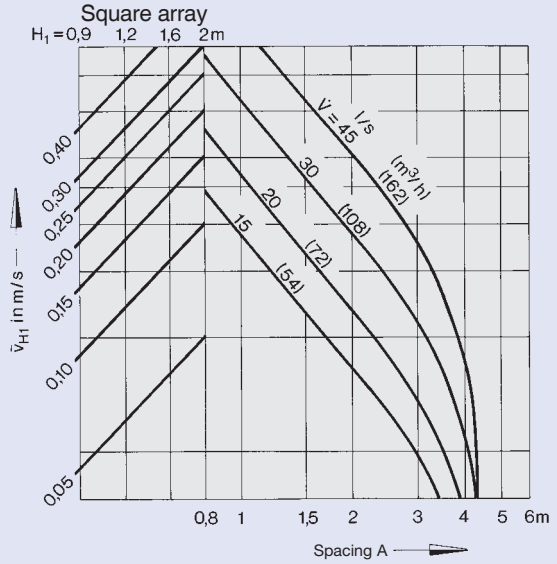
19 Diffuser arrangement:
more than one row if B = 3.00 m



20 Temperature Quotient



21 Diffuser arrangement:
Square array

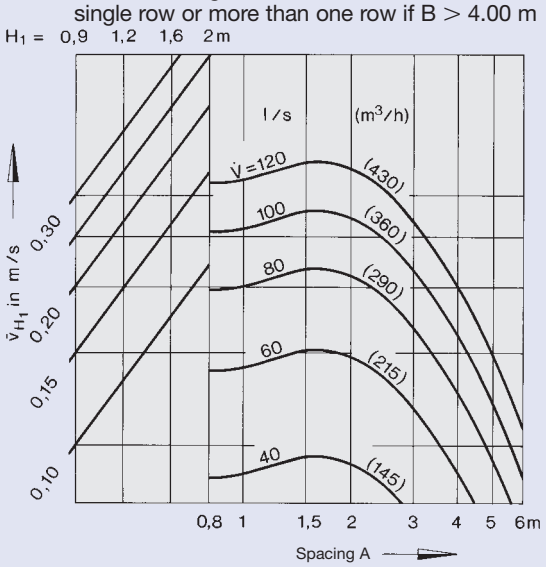


Aerodynamic Data

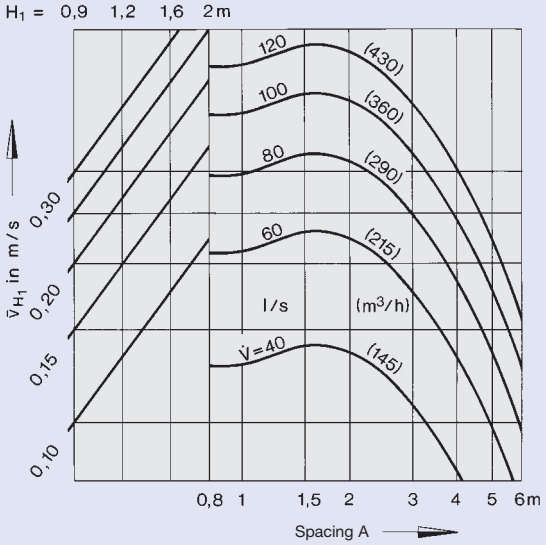
Size 400 x 16

Correction!
For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

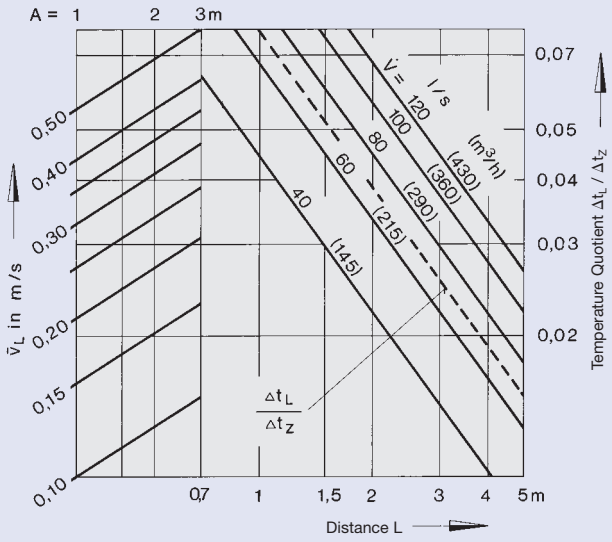
22 Diffuser arrangement:
single row or more than one row if B > 4.00 m



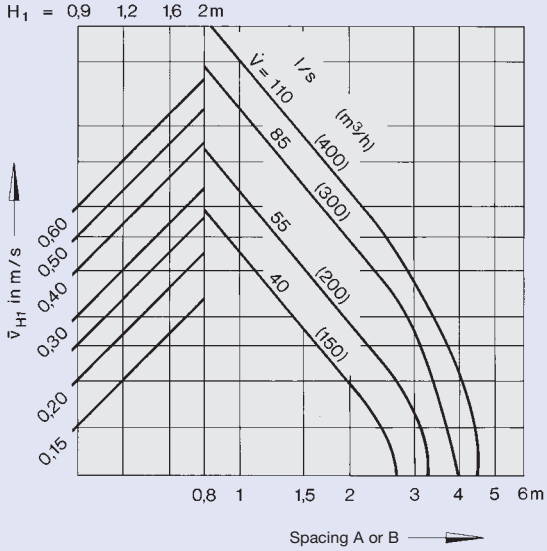
23 Diffuser arrangement:
more than one row if B = 3.00 m



24 Temperature Quotient

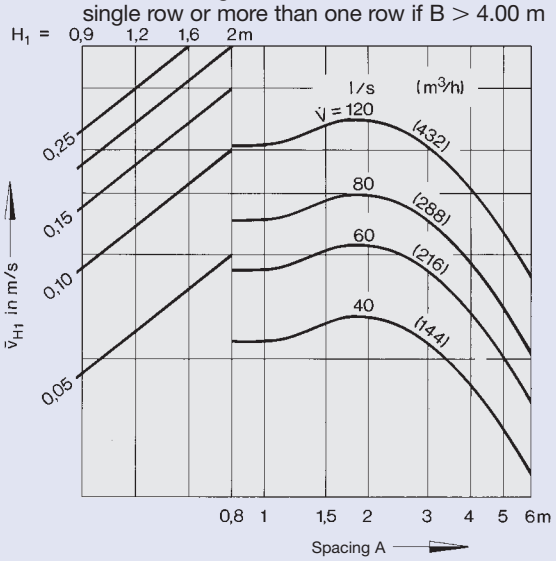


25 Diffuser arrangement:
Square array

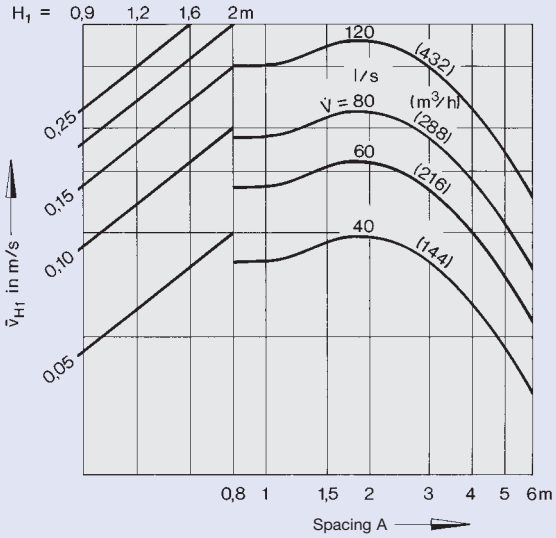


Correction!
For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

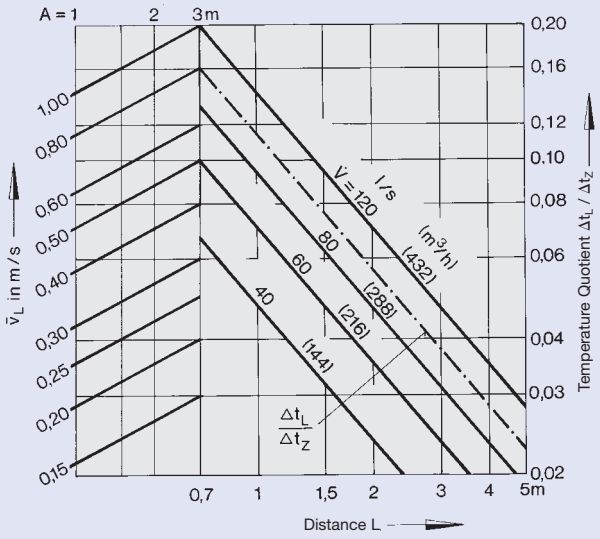
26 Diffuser arrangement:
single row or more than one row if B > 4.00 m



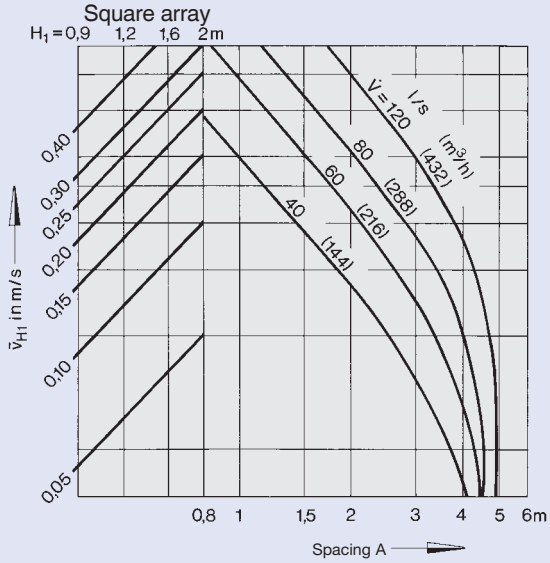
27 Diffuser arrangement:
more than one row if B = 3.00 m



28 Temperature Quotient



29 Diffuser arrangement:
Square array



Aerodynamic Data

Size 600 x 48

Example

Data given:
A hall measuring B x L x H = 24 m x 24 m x 3.40 m is to be designed using SDW swirl diffusers for supply air.

Total volume flow rate	$\dot{V}$ = 16000 l/s (57600 m³/h)
Supply air temperature differential	Δt_z = – 8 K
Room temperature	t_R = 24 °C

For structural reasons, no diffuser should be placed closer than 3 m to the external facade.

Correction!

For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

For adjustment of blade rings for external swirl, the diagram values must be multiplied by 1.25!

Requirement: Air velocity $\bar{v}_{H1}$ and $\bar{v}_L$ should not exceed 0.2 m/s. The regenerated noise level of each diffuser is limited to L_{WA} = 30 dB(A).

Initial observation:
Since the diffusers have to be arranged at a distance of X = 3 m from the external facade, the remaining area available for installation is 18 m x 18 m.
Consider a distance between rows B = 3.0 m
This results in 7 rows

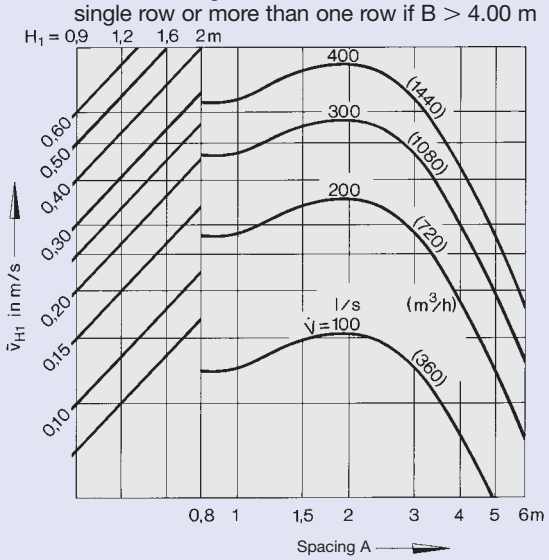
$$\dot{V} \text{ per row} = \frac{16000 \text{ l/s}}{7} \approx 2280 \text{ l/s}$$

For spacing of diffusers along the rows select A = 1.0 m.
This results in 19 diffusers per row.

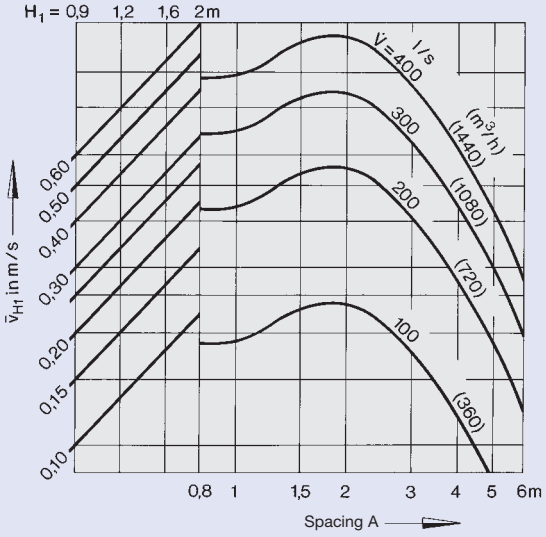
The volume flow per diffuser then becomes

$$\frac{2280 \text{ l/s}}{19} = 120 \text{ l/s}$$

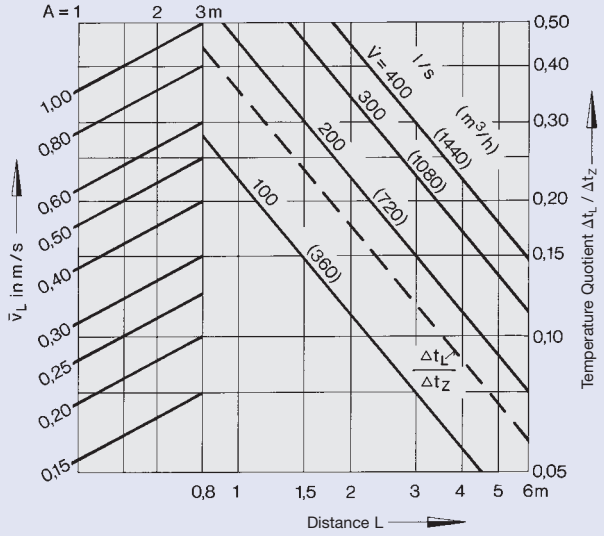
30 Diffuser arrangement:
single row or more than one row if B > 4.00 m



31 Diffuser arrangement:
more than one row if B = 3.00 m



32 Temperature Quotient



33 Diffuser arrangement:
Square array

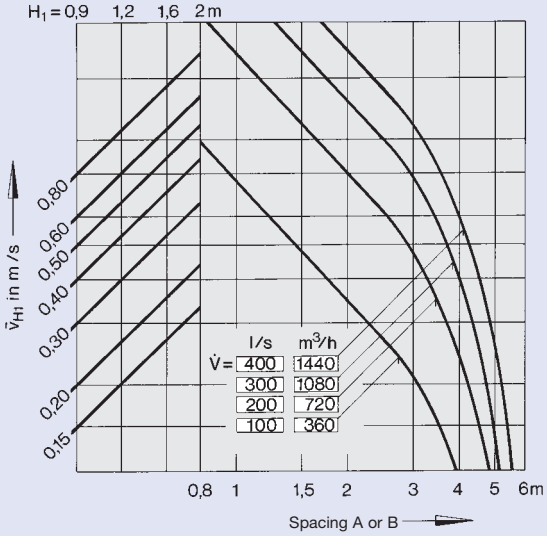


Diagram 10: Sound power level and pressure drop
L_{WA} = 27 dB(A) (L_{WNC} = 21 NC)
Δp_t = 12 Pa

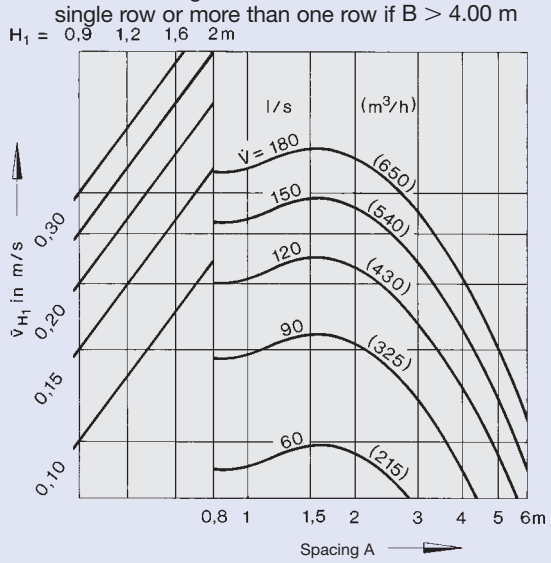
Diagram 35: Square diffuser: more than one row if B = 3.00 m
H_1 = H – 1.70 = 1.70 m
$\bar{v}_{H1}$ = 0.17 m/s

Diagram 36: Temperature Quotient between two diffusers
L = H_1 + A/2 = 2.20 m
$\Delta t_L/\Delta t_Z$ = 0.05
Δt_L = – 8 x 0.05 = – 0,4 K
L = H_1 + X = 4.70 m at the wall
$\bar{v}_L$ = 0.18 m/s
$\Delta t_L/\Delta t_Z$ = 0.023
Δt_L = – 8 x 0.023 = – 0.2 K

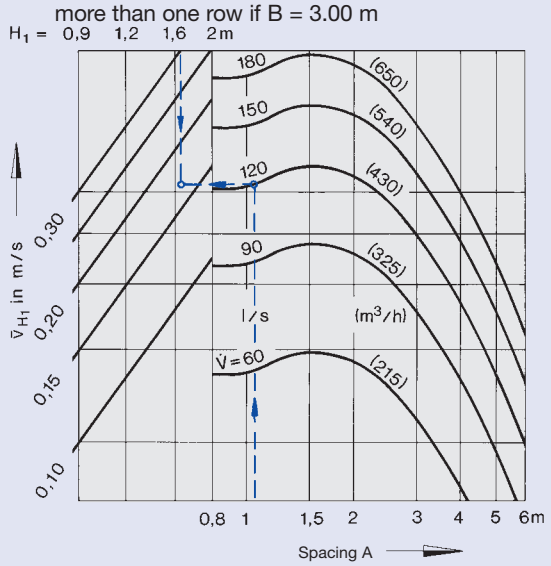
Result:
133 off SDW - Q - Z - H / 600 x 24
At the required air change rate of 30 per hour, the noise level requirements are met and the limiting air velocities not exceeded.

Correction!
For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L/\Delta t_Z$ must be multiplied by a factor of 0.71!

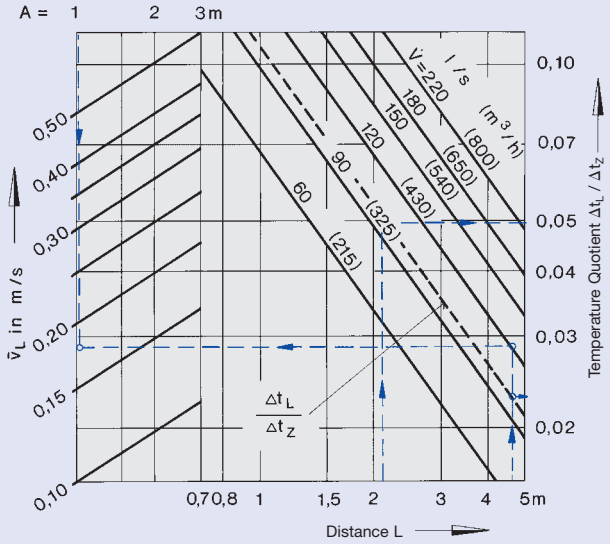
34 Diffuser arrangement:
single row or more than one row if B > 4.00 m



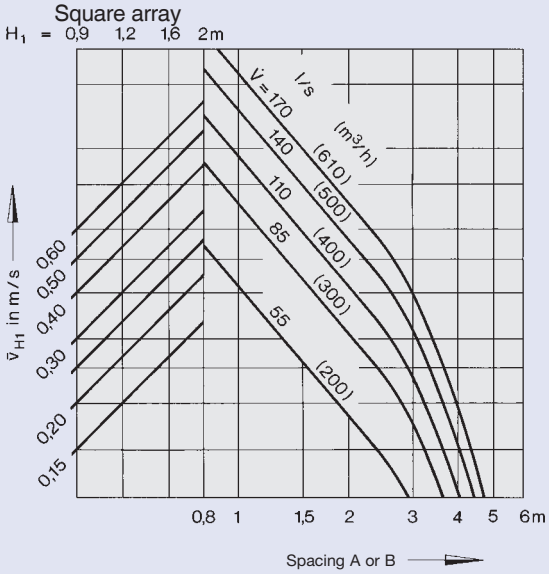
35 Diffuser arrangement:
more than one row if B = 3.00 m



36 Temperature Quotient



37 Diffuser arrangement:
Square array



Aerodynamic Data

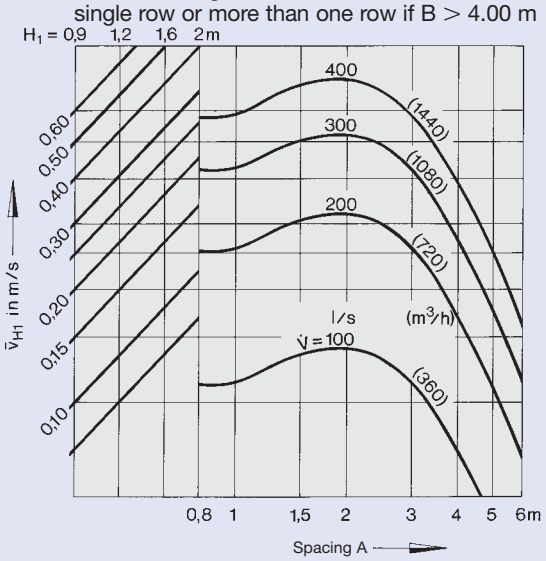
Size 625 x 54

Correction!

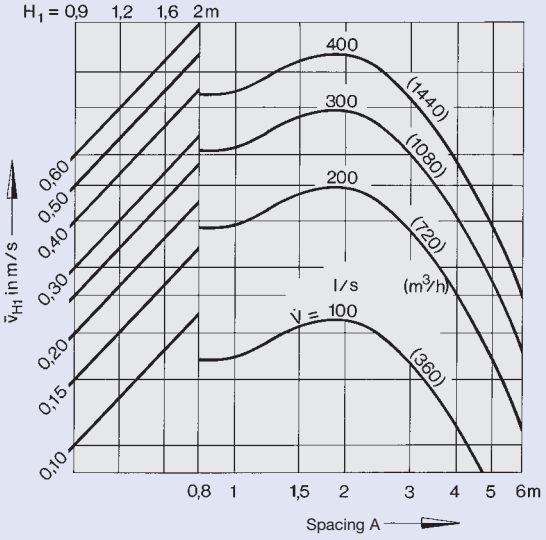
For an installation below a continuous ceiling (suspension depth >300mm), the values $\bar{v}_{H1}$, $\bar{v}_L$, and $\Delta t_L / \Delta t_Z$ must be multiplied by a factor of 0.71!

For adjustment of blade rings for external swirl, the diagram values must be multiplied by 1.25!

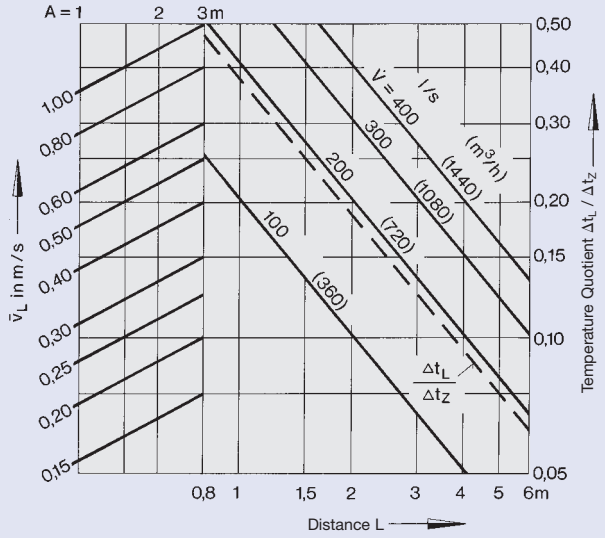
38 Diffuser arrangement:
single row or more than one row if B > 4.00 m



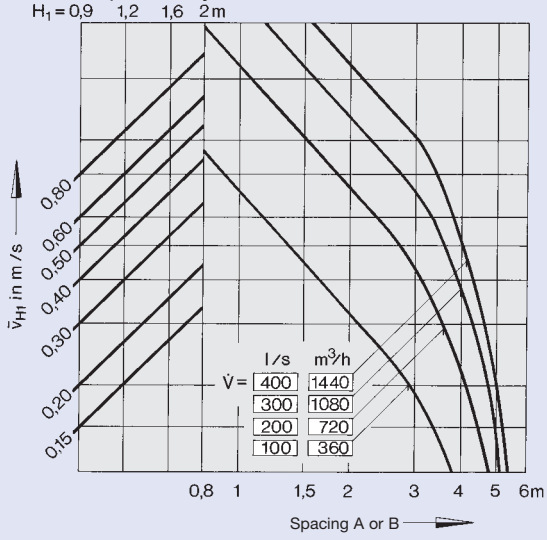
39 Diffuser arrangement:
more than one row if B = 3.00 m



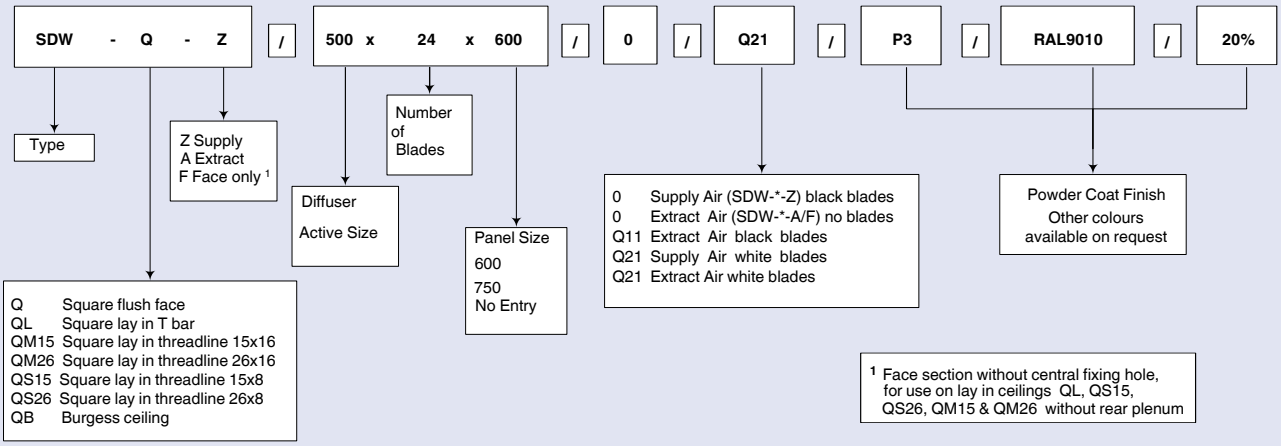
40 Temperature Quotient



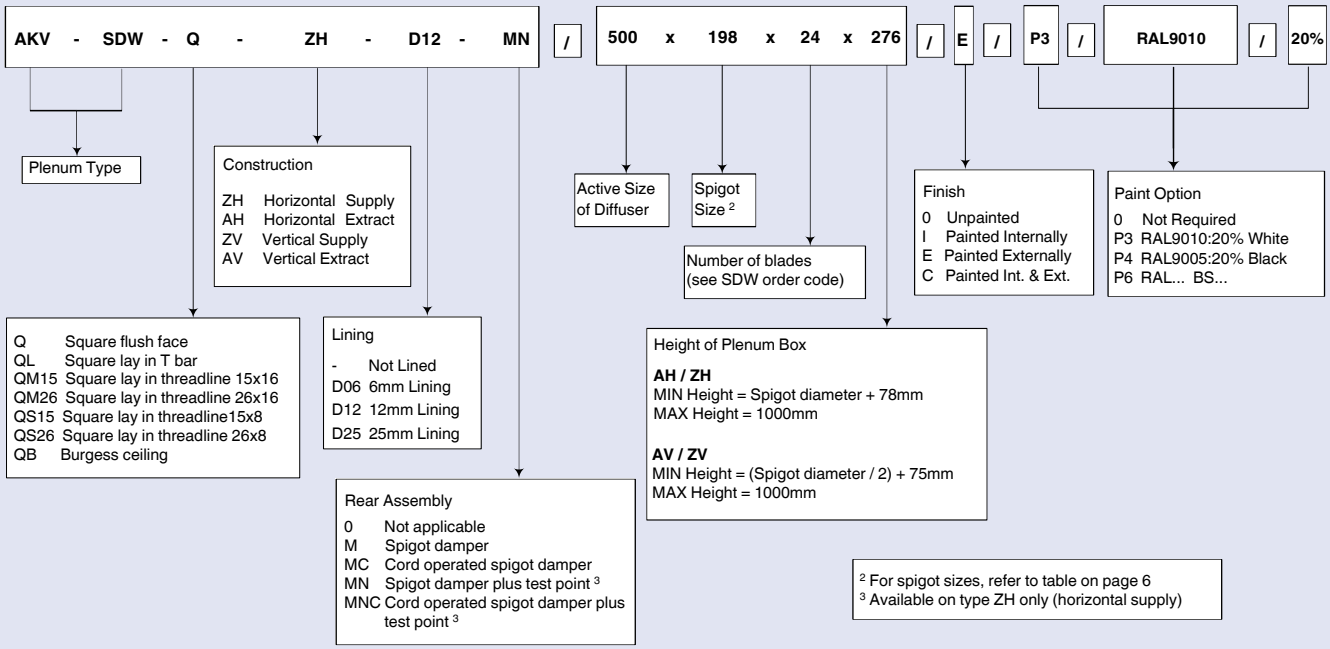
41 Diffuser arrangement:
Square array



Diffuser Order Code



Plenum Order Code



Specification Text

Adjustable square face swirl diffusers with swirling horizontal discharge of supply air with high induction. For air change rates up to approximately 30 per hour. Consisting of a pressed front face with radially angled air discharge sections incorporating adjustable directional air control blades. Supplied with plenum box incorporating special internal control elements, complete with circular top or side entry spigots (with optional volume control damper or test connection for reference pressure measurement, cord operation and test nipple). Plenum box has Ø7mm holes in the top return edge for suspension wires or rods (by others). The face plate can be fitted and removed by means of the centre fixing screw.

Material:
The face plate is in galvanised sheet steel. The surfaces are pre-treated and powder coated white (RAL 9010).

The control blades are made from Polystyrol (PS 476 L), with black (similar to RAL 9005) as standard or white (similar to RAL 9010) on request.
The plenum box is made from galvanised sheet steel.

Order example

Make: TROX
Type: SDW-Q-Z / 500 x 24 x 600 / 0 / Q21 / P3
Type: AKV-SDW-Q-ZH-D12-MN / 500 x 198 x 24 x 276 / E / P3